

REMARKS

I. Status of the claims

Claims 1-9 are pending. Claim 1 has been amended recite a preferred NOx range that more closely follows emission reduction value in Table 1. No new matter has been added through this amendment.

II. Rejection under 35 U.S.C. § 112, first paragraph

The examiner has rejected claims 1-9 under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. In particular, the examiner does not find support for the limitation, “wherein the biodiesel is capable of exhibiting an NOx emission reduction value in the range of 10-55% when used alone without engine modification.” The examiner states that Applicants have not explained how they arrived at the claimed range and do not point out where in the specification it is disclosed that there is no engine modification.

In this response, Applicants have limited the previously recited range of 10-55% to 14-53% to make the range more commensurate with Table on page 11. As can be in the table, six biodiesel samples (biodiesel plus BS1-BS5) have been analyzed against a comparative diesel sample (diesel) for five different loads. For the top group, when the load is zero, the percentage of NOx reduction, calculated by analyzing the NOx of the various biodiesels of the claimed invention against the NOx of the diesel, ranges from 14.4% to 53.3%. The following chart shows the calculations of the NOx emission reduction value:

Biodiesel sample @ Load KW = 0	NOx of biodiesel sample (ppm)	NOx of diesel in comparative sample (ppm)	Reduction in NOx (ppm)	Reduction in NOx (%)
Biodiesel	111	180	69	38.3
BS1	154	180	26	14.4
BS2	96	180	84	46.7
BS3	125	180	55	30.6
BS4	113	180	67	37.2
BS5	84	180	96	53.3

As can be seen in the chart, the biodiesel formulations of the invention, as analyzed

against the diesel, have the capability of exhibiting an NO_x emission reduction value in the range of 14-53%.

Applicants have also removed the limitation relating to engine modification. The biodiesels of the claimed invention have not been subjected to a condition of engine modification to produce the demonstrated NO_x reduction. However, for purposes of expedited prosecution in this application, Applicants have removed this term from the claims.

In view of the above explanation showing support for the range and how the values were arrived at, Applicants respectfully request that the examiner withdraw this rejection under 35 U.S.C. § 112, first paragraph.

III. Rejections under 35 U.S.C. § 103(a)

The examiner rejected claims 1-8 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,127,560 to Stidham et al. ("Stidham") in view of the article entitled, "Triglycerides-based diesel fuels," by Srivastava et al. ("Srivastava"). The examiner has also rejected claims 6 and 9 under 35 U.S.C. § 103(a) as being unpatentable over Stidham in view of U.S. Patent No. 5,116,546 to Klok ("Klok"). Applicants respectfully traverse these rejections.

The processes disclosed in Stidham and Srivastava relate to liquid-liquid phase reactions, whereby liquid oil and liquid alcohol-catalyst mixture (below the boiling point of alcohol) are reacted under certain conditions to obtain esters (biodiesel) in liquid phase. See Stidham, col. 4, lines 48-56 and col. 7, lines 31-47 (describing the oil and catalyst/alcohol mixture as "liquids"); see also Srivastava, p. 126, item 6.4.1 ("The maximum yield of esters occurs at temperatures ranging from 60 to 80 °C at a molar ratio (alcohol to oil) of 6:1. Further increase in temperature is reported to have a negative effect on the conversion.").

In contrast, the claimed invention relates to liquid-gas phase reaction, whereby liquid oil and gaseous alcohol-catalyst mixture (above the boiling point of alcohol) are reacted to obtain liquid esters (biodiesel). This limitation may be found in the transesterifying step of the claims, wherein the transesterification reaction takes place at a temperature higher than the boiling point of the alcohol but not exceeding 215 °C.

In the Office Action, the examiner states that Stidham differs from the claims in that it does not teach all the process parameters with respect to time and temperature. See page 5,

second paragraph, of the Office Action. The examiner maintains, however, that these differences will not support patentability of the claimed subject matter.

However, these differences are one of the main factors that enable the claimed biodiesels to produce the reduced NOx values. The liquid-liquid phase reaction disclosed in the prior art can actually increase the NOx emission value of the final biodiesel, which is undesirable for environmental concerns.

In view of the possibility of increased NOx values through the one-phase liquid-liquid reaction, Applicants have employed the two-phase reaction of this invention. In the claimed reaction, liquid oil is reacted with a gaseous alcohol-catalyst mixture. This feature has assisting in enabling the reduction of NOx emission value of the resulting biodiesel (as shown in the Table on page 11), thereby making the biodiesel product ecofriendly and preferable from an environmental perspective.

Stidham and Srivastava, alone or in combination, do not teach or suggest a method of using a liquid-gas phase reaction to prepare biodiesel where the biodiesel is capable of reducing NOx emissions. Nor do the references suggest any of the advantages of using a liquid-gas phase reaction, as recited in Applicants' claimed invention. In fact, Srivastava appears to teach against increasing the temperature, stating that increased temperatures have a negative effect on conversion. See p. 126, item 6.4.1. Klok, which has been cited by the examiner only to show the filtration techniques, fails to overcome the above-noted deficiencies of Stidham and Srivastava. Accordingly, the claimed invention is patentable over Stidham, Srivastava, Klok, or any combination of these references.

In view of these comments, Applicants respectfully request that the examiner withdraw the rejections under 35 U.S.C. § 103.

IV. Conclusion

Applicant respectfully requests reconsideration of this application in view of the above amendment and remarks.

Except for issue fees payable under 37 C.F.R. §1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§1.16 and 1.17 which may be required,

including any required extension of time fees, or credit any overpayment to Deposit Account No. 19-2380. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. §1.136(a)(3).

Respectfully submitted,

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Dated: September 29, 2008

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